



THE LION CHAMBERS

PROPOSED CREATIVE CO-WORKING & LEARNING SPACE IN GLASGOW

Heritage Roots
— Reflect, Celebrate & Revive —

BUILDING CONDITION & MAPPING

WITH POSSIBLE INTERVENTIONS

MSc ARCHITECTURAL DESIGN FOR THE CONSERVATION OF BUILT HERITAGE UNIVERSITY OF STRATHCLYDE - GLASGOW
CONSERVATION DESIGN PROJECT - ELINA MARIA YLIMAKI - 2020 / 2021

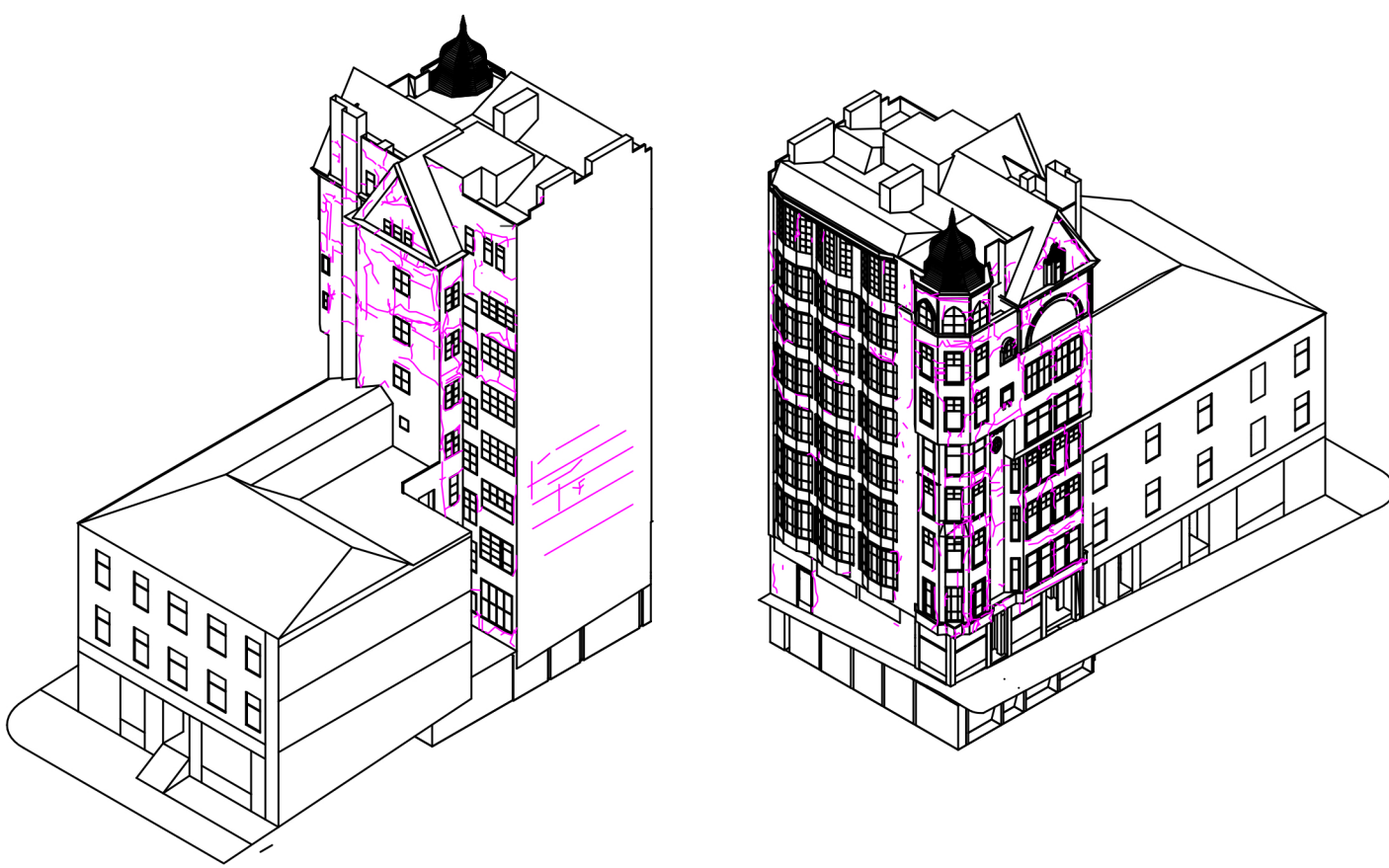
KEY TO CONDITION MAPPING

Crack & Deformation	Detachment	Material Loss	Discolouration & Deposit	Biological Colonization	Other
Structural Cracks	Blistering	Erosion	Efflorescence	Plants	Exposed Metal
Surface crazing	Dusting	Missing/broken or covered windows	Water stain	Biological Colonization	Steel Bars
	Delamination	Missing parts	Discolouration	Moss	Runwater down joint / ventilation
	Spalling	Timber decay/loss	Graffiti		Loss of pointing
	Scaling	Amalgamation	Crust		Metal inclusion
	Metal corrosion		Deposit		
	Exfoliation		Patina		
	Sanding		Most Area		
	Burning		Subefflorescence		

EXISTING BUILDING MATERIALS



CRACKS & DEFORMATION



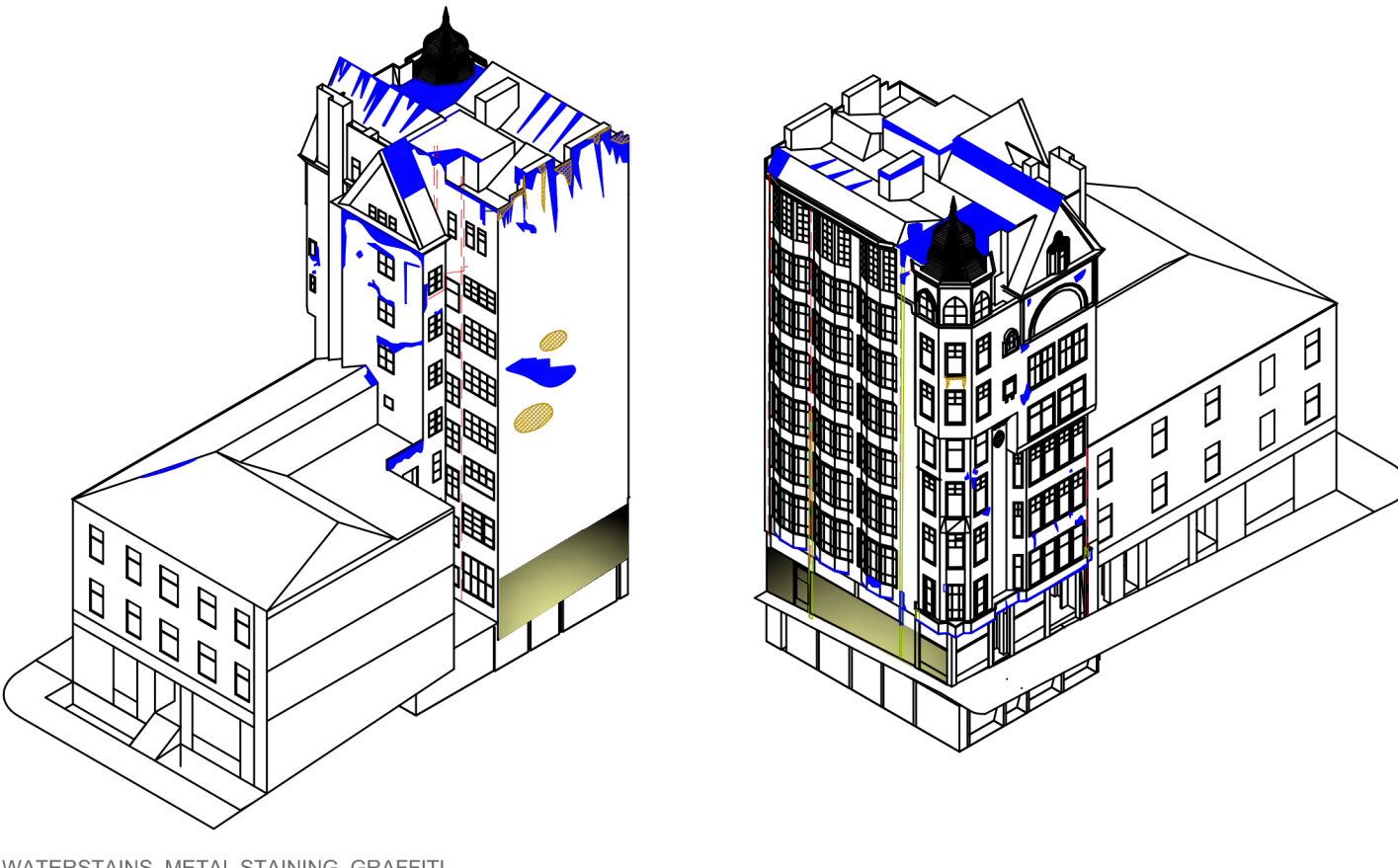
CRACKS

Pathology	Cause of decay	Further investigation	Proposed intervention
Cracks	Non structural cracks are common in reinforced concrete which often occur during and just after the construction phase and thereafter. Cycles of wet and dry can cause surface cracking. For example due to faulty rainwater goods. Historic concrete was often affected by poor workmanship and issues relating to how the concrete was mixed, placed and cured.	Any structural cracks to be addressed by a structural engineer. Prepare site test to evaluate if the cracks are structural or non structural and what the main cause is. Cracks are generally the buildings way of creating a movement joint as a structural connection should be installed or a movement joint should be formed to structural engineers details.	A fine cement grout is the best material for crack repair if the investigation has been done before commencement of the works or there is a risk that the cracks will reappear.



Surface cracking (and spalling) visible on the concrete surface.

DISCOLOURATION AND DEPOSIT

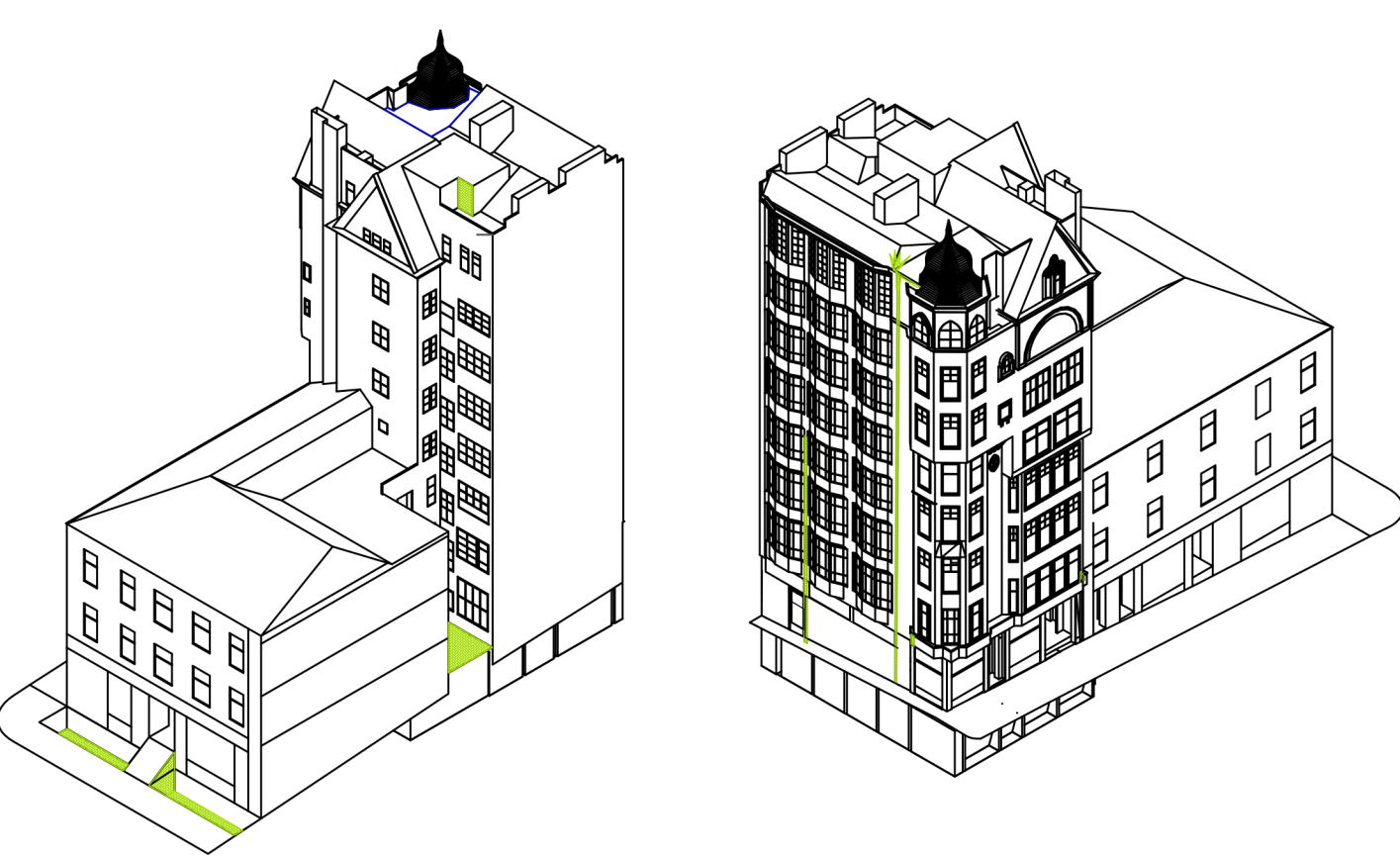


WATERSTAINS, METAL STAINING, GRAFFITI

Pathology	Cause of decay	Further investigation	Proposed intervention
Water stain	Water stains on walls and pooling of water on the roof are possibly due to decayed watergoods, blockage and poor detailing.	A full detailed visual inspection of the rainwater goods. CCTV cameras through drain pipes may be necessary to investigate any blockages/ damage which may cause water stains. Measure the absolute moisture content with the help of samples and measure the weight differences of various concrete samples, saturated with water and dry samples to make a comparison. An alternative method of measuring moisture is the capacitance moisture meter, which is a quick method to estimate moisture levels. Although not providing an absolute measure it gives an indication of the levels. Readings can be affected by contaminations or salt for example. Use of wooden pine dowels is another method where wooden rods are isolated from the concrete with a rubber band in the sealed holes. They are left in the concrete for a minimum of three weeks. This will give the wood a chance to reach equilibrium.	Overhaul decayed watergoods and dry out the concrete. Renewal of the rainwater goods perhaps also upgrading sizes due to additional rainfall and climate change. Possibly adding a 'jacket cover' over the building for some length of time to give the building a chance to dry out.
Graffiti	Existing graffiti paintings on walls which may be of historic interest, that could be preserved.	Investigate if the paint is harming the concrete or if some of the graffiti can be preserved or painted over or incorporated with new murals from a removed artist.	Clean or paint over some of the graffiti which may be covered or not of historic interest. Invite an artist to paint a piece of art work on the back wall to celebrate the history of the Lion Chambers.
Discolouration/ metal staining	Corrosion of rebars.	Cleaning to BS 8221-1:2000 Code of practice. (Guidance only). Sample tests to be done before commitment.	Stained area to be corded out and then sample test should be used to remove the stains with dilute acid (sulfuric or nitric acid) (2012, Odgers)



BIOLOGICAL COLONIZATION

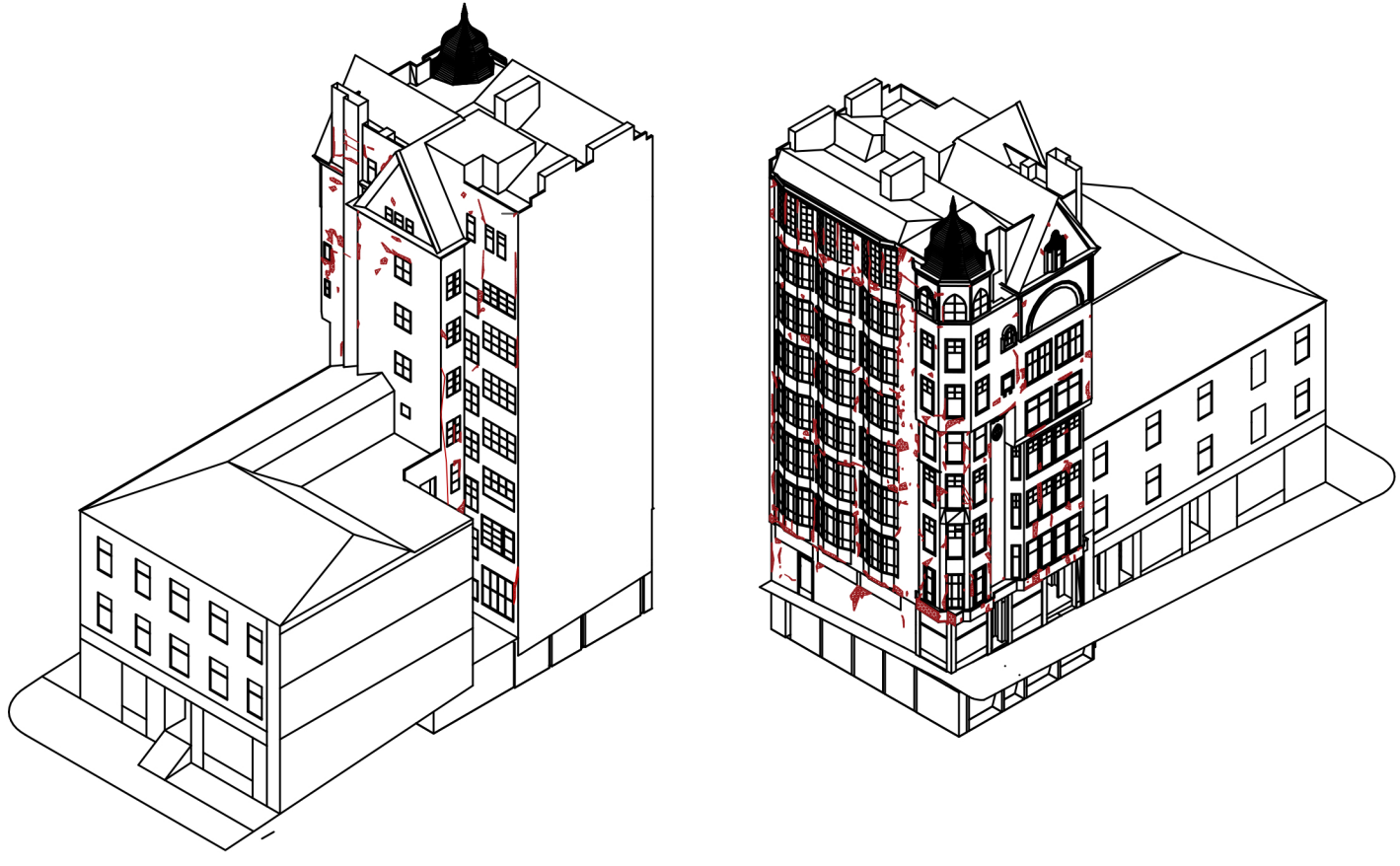


BIOLOGICAL DETERIORATION

Pathology	Cause of decay	Further investigation	Proposed intervention
Plants	Plants and biological deterioration like algae thrive in wet and damp environments. When the concrete slowly carbonates over time it becomes porous and where there is damp the algae and moss can easily grow.	Laboratory tests are helpful to investigate the type of biological plants on the surfaces.	Removal of any visible plants including the roots. Cleaning of the possible algae to BS 8221-1:2000 Code of practice. (Guidance only). The cause of the biological components has to be addressed first or it will reappear soon after.



DETACHMENT

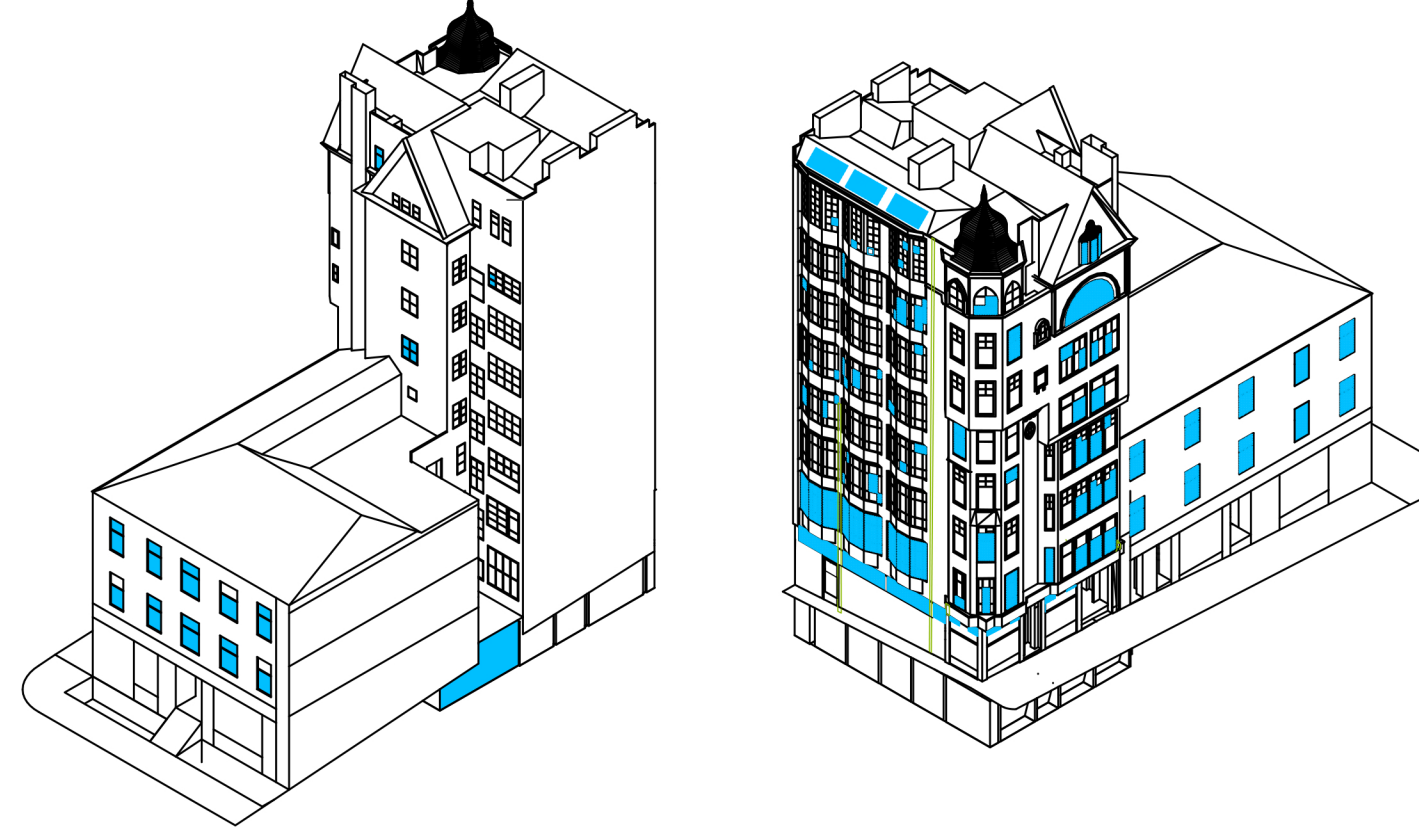


SPALLING

Pathology	Cause of decay	Further investigation	Proposed intervention
Spalling	Spalling is characterized by fragments, scales or slabs falling of the concrete. Spalling is the end result of delamination or cracking and can be caused by the following: frost, sulphate attack, salts and corrosion of rebars.	Investigate the area to be patched required, if it has high levels of chlorides. with various samples 75 mm from the surface, to be tested in a laboratory.	Patch repairs to blend in with existing concrete. There are risks if there are high levels of chlorides in the concrete in combination with the use of high alkali mortar which is supposed to suppress corrosion. This can remove the corroding anode which has protected the surrounding less contaminated cathodic areas. It is rare in non contaminated concrete. British Standard: Repair of the existing fabric to BS EN 1504:2008 products and systems for the protection and repair of concrete.



MATERIAL LOSS



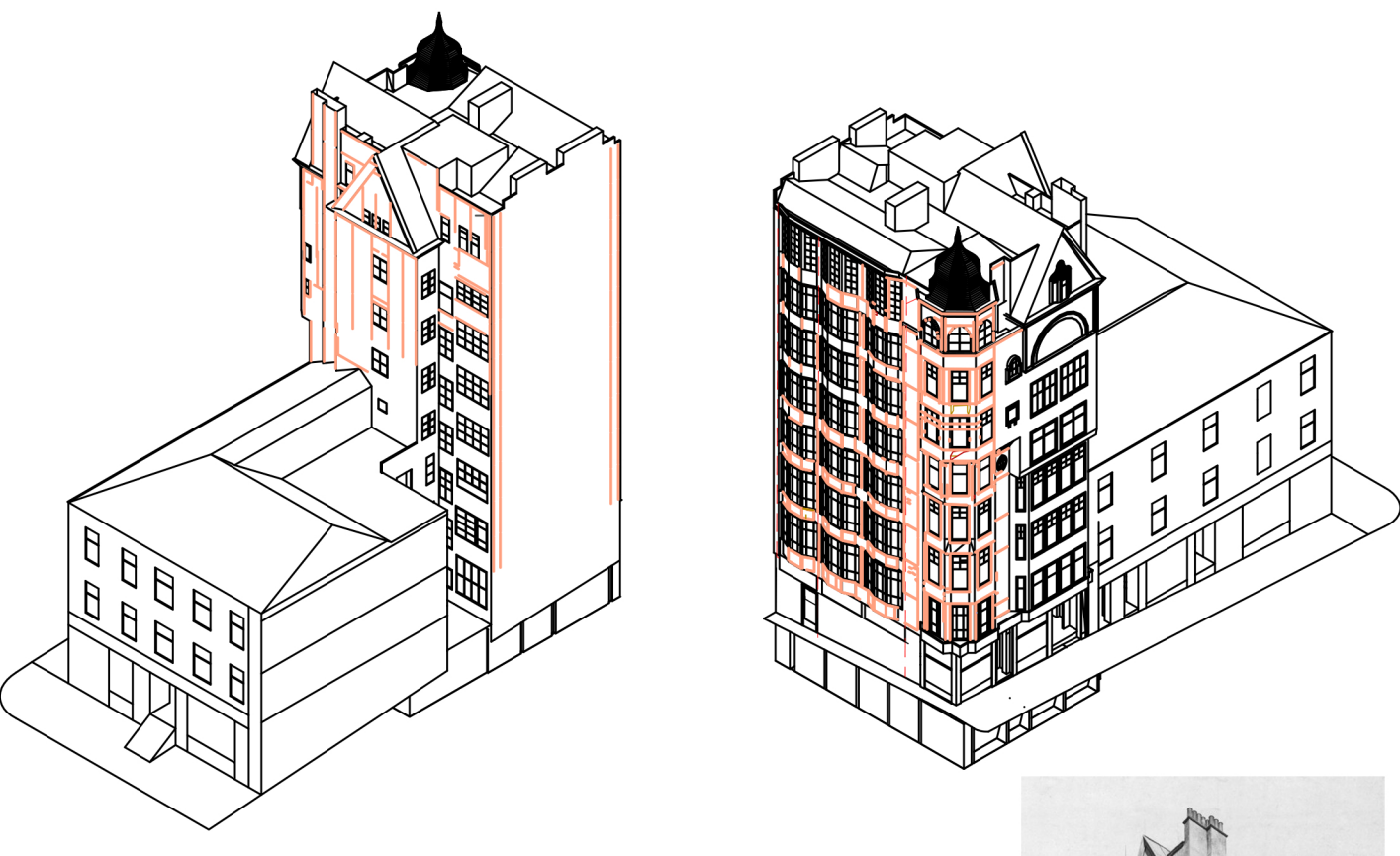
MISSING/ BROKEN OR COVERED WINDOWS

Pathology	Cause of decay	Recommended further investigation	Proposed intervention
Missing/broken or covered windows	The timber sash windows has not been regularly maintained. The metal windows (both metal and timber) have not been maintained regularly and after from decay and broken glass.	Additional surveys of the window sizes and careful detailing is needed. Sample windows to be produced.	Update all windows to slimline heritage triple glazing to match existing windows. To help with reducing the carbon footprint. Possibly aluminium composite windows with timber frame.

Source: original drawing by Robertson Architects & Partners. Condition mapping by Nelson & Thomas, 2011. Taken by Thomas 2011.

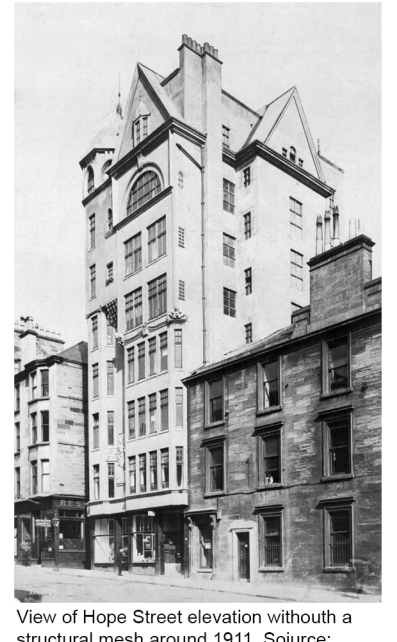
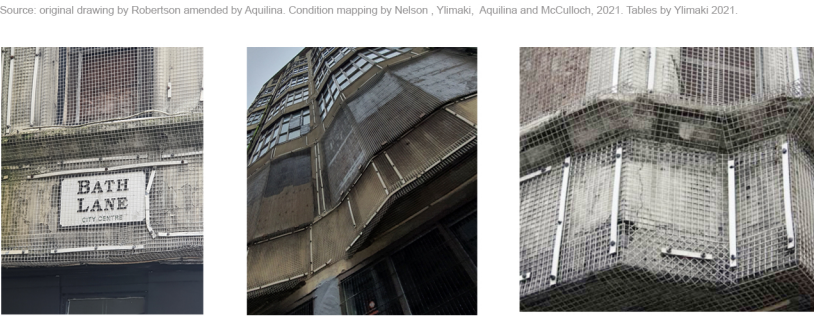


OTHER



STEEL BARS AND MESH

Pathology	Cause of decay	Further investigation	Proposed intervention
Steel bars (including as ferris and mesh)	The structural steel mesh was installed in 2004 to stop spalling concrete from falling. (Parker, 2012). It is fixed with H16 screws and removal of H16 screws will cause damage to the existing concrete fabric, which has to be repaired.	Structural steel mesh removal and process to be investigated by a structural engineer. Repair of the existing fabric to BS EN 1504:2008 products and systems for the protection and repair of concrete after removing the screws, one section at the time.	Removal of steel mesh to Structural engineers details. Repair of the existing fabric to BS EN 1504:2008 products and systems for the protection and repair of concrete after removing the screws, one section at the time.



THE CUPOLA ROOF

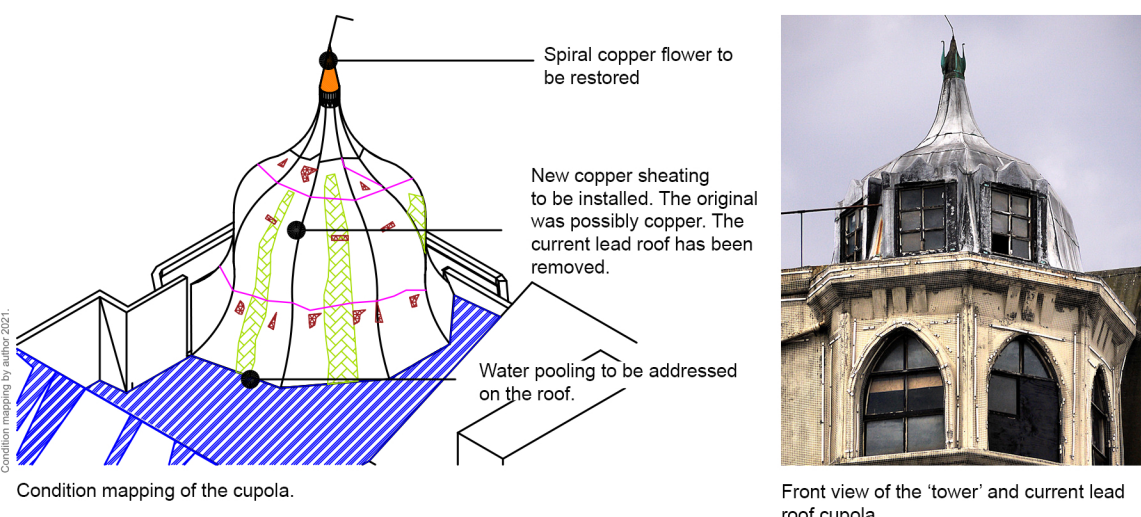


Photo & Feature	Pathology	Cause of Decay	Recommended Further Investigation	Proposed Intervention
1) Existing bitumen type roof covering	Water stain Biological Deterioration Cracks in roof material	Possible bitumen roof coverings standing in water causing excessive decay + due to old age. Plants and vegetation growing on the roof due to wet conditions.	A full detailed visual inspection and measured survey of the roof is needed to be able to address any issues accurately.	Full replacement of roof to keep the building water tight. Removal of plants including removal of its roots.
2) Lead sheathing to cupola roof & copper flower spiral on the top	Water stain Biological Deterioration Erosion: Metal delamination Cracks in roof material and concrete	Lack of maintenance and aged materials. Slown leaching has increased any deterioration of the roof internally as well as externally. The original roof was covered in copper. Bird droppings can possibly have caused any corrosion on the metal. Plants and vegetation growing on the roof due to wet conditions.	A full detailed visual inspection and measured survey of the roof is needed to be able to address any issues accurately. Further inspection of the copper spiral.	Install new copper sheathing to the turret. The copper spiral should be cleaned, repaired & restored. Any corrosion should be removed. The copper spiral can be corrosion protected with benzotriazole (BTA) followed by protective wax coatings. CCRH regulations has to be followed using these (BTA) products.
3) Drainage, rainwater pipes etc.	Erosion: Metal delamination Other: Drainage issues	Lack of maintenance and aged materials. Pollution, bird droppings and acid rain increases erosion. Any drainage blockages can be caused by plant materials or infestations.	A full detailed visual inspection and measured survey of the roof is recommended and particularly a drainage inspection with cob cameras.	Replacement of eroded rainwater pipes and blocked drains. Larger pipes may be needed which may have a cosmetic / visual implication.

PIGEON & RAT INFESTATION

Pulmonary infections can be caused by dust from bird droppings, feathers and nesting materials when inhaled. It is important to first damp any droppings and to be removed by wooden spatulas and sealed in plastic bags. Larger quantities has to be handled by registered waste carriers. (English Heritage, Practical Building conservation, Odgers, 2012)



INITIAL INVESTIGATIONS

INVESTIGATIONS

Ownership and boundaries has to be established including any party wall agreements.

A new structural report should be undertaken by a structural engineer on a floor by floor basis with regards to the foundations and the structural integrity of the columns and the structural envelope and its loading capacity to conclude what strengthening is needed.

Petrography and chemical analysis has to be undertaken of the concrete.

A asbestos survey also has to be completed before any commencement of works, if deemed safe by a structural engineer. The pigeon and rat infestation also has to be cleaned up before commencement of work.

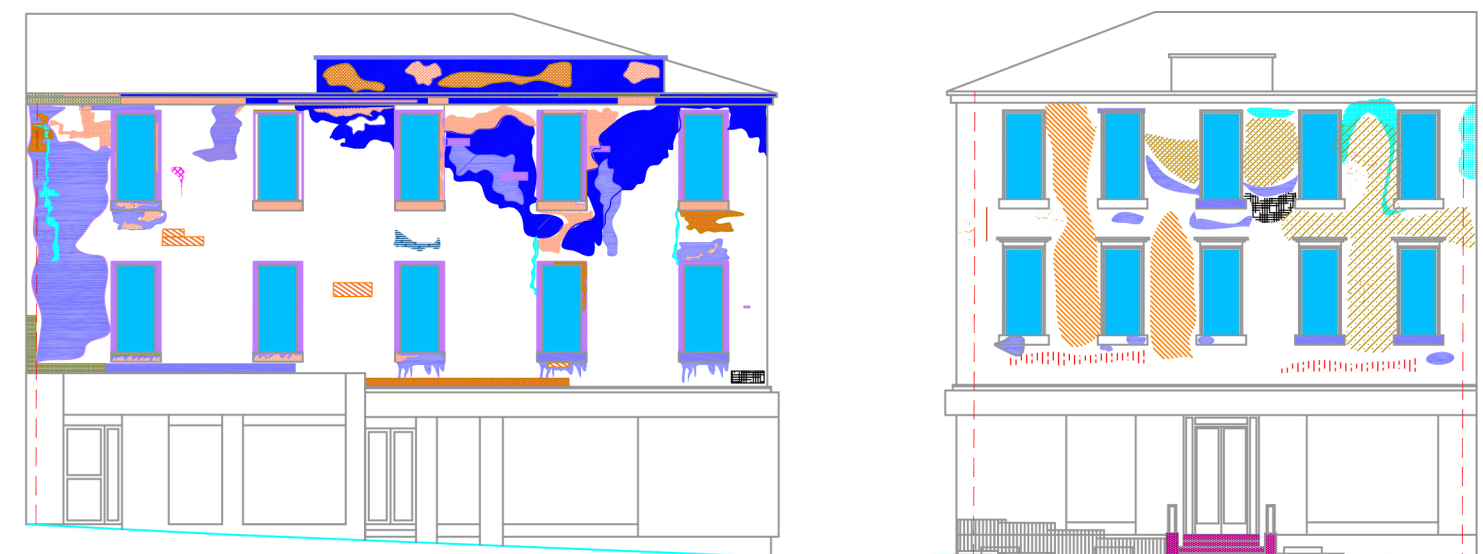
DRY OUT THE BUILDING

Dehumidification is required to remove excess water in the various building materials. A printed building wrap on scaffolding with dehumidifiers can possibly be one solution to start drying out the building.



Building wrap and dehumidifiers to dry out the building initially. (Source: embracebuildingwraps uk)

GEORGIAN CORNER BUILDING CONDITION MAPPING



GEORGIAN CORNER BUILDING CONDITION MAPPING - HOPE STREET AND WEST REGENT STREET ELEVATION @ 1:200 @ A1
Original condition mapping drawing of georgian corner building, Scotland 2021, elaborated by author, 2021

Note: The assessment is based on various reports from various years. Drawings are indicative only and a full current survey and further investigations are recommended.

Pathology	Cause of decay	Recommended further investigation	Proposed intervention
Water stain	Decayed and corroded watergoods due to old age, acid rain deteriorating the pipes and lack of maintenance. Water stains on walls and pooling of water on the roof are possibly due to decayed watergoods, blockages and poor detailing.	A full detailed visual inspection of the rainwater goods. CCTV cameras through drain pipes may be necessary to investigate any blockages/ damage.	Renewal of the rainwater goods perhaps also upgrading sizes due to additional rainfall and climate change.
Crust	Black crust generally consist of particles from the decomposition (degradation) trapped into a gypsum (CaSO4.2H2O) composite. Chromatic modification of the material, generally resulting from natural or artificial ageing and not involving in most cases visible surface deterioration. (Odgers, 2012)	Mineralogy and the sandstones petrology should be investigated. A sample clearing trial area has to be done before full application.	The use of clay pozzolite which allows for larger areas to be cleaned in a controlled manner.
Patina	Chromatic modification of the material, generally resulting from natural or artificial ageing and not involving in most cases visible surface deterioration. (Odgers, 2012)	Mineralogy and the sandstones petrology should be investigated. A sample clearing trial area has to be done before full application.	The use of clay pozzolite which allows for larger areas to be cleaned in a controlled manner.
Efflorescence	White soluble salt crystals on the surface. Caused by evaporation of saline water present in the porous stone structure. For example due to air pollution. (Odgers, 2012)	Chemical test to be made to find out salt composition. It can be sodium chloride/magnesium sulphates or can be made of less soluble salts like calcium sulphate or anhydrous silica.	Dry removal of the salts, brackish crusts of salts can be removed by scaled and vacuumed.
Blistering	Concentration of salts can cause blistering in sand stone. Salt crystallisation behind a water resistant coating of paint can cause larger areas of detachment of the sandstone.	Mineralogy and the sandstones petrology should be investigated. A sample clearing trial area has to be done before full application.	Careful removal of the paint. Labour intensive tools such as metal spatulas & scrapers. Dry air abrasion could also be used or dry poultice.
Exfoliation	A form of delamination where stone breaks off to layers which can be due to failure of the surface part of the stone. Thermal stress of the surface and underlying stone.	Mineralogy and the sandstones petrology should be investigated. A sample clearing trial area has to be done before full application.	Depending of depth of the delamination the stone may have to be replaced.
Paint on sand stone wall	Non permeable paint can cause damp issues and failure of the stone.	Investigate what type of paint is currently on the stone surface. The control of Lead at Work Regulations 1998 covers commercial situations.	Careful removal of the paint. Labour intensive tools such as metal spatulas & scrapers. Dry air abrasion could also be used or dry poultice.
Loss of pointing	Loss of pointing will cause water ingress and damp walls, which will decay the stone and mortar.	Ensure the lime mortar is compatible with the existing sandstone. Sample mortars should be tested on the wall.	Repoint with lime mortar.
Surface crazing (fine random cracks) to concrete steps, this is not an excessive flaking resulting in higher concentration of cement and fine aggregate in the surface.		A full detailed visual inspection and survey of the area. Structural engineers input for the new structure.	Due to a proposed new balcony area next to existing steps and new stone area for the basement. A new in situ cast smooth concrete steps area is proposed.

Condition mapping table by author 2021



West Regent Street elevation of the Georgian corner building. Source: Image by Author



Hope Street elevation of the Georgian corner building (Source: Google maps-street view)